

Time-dependent diffraction and optic phonons

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Abstract: X-ray pulses in the sub 100 fsec regime may allow the probing of some of the fastest structural changes in condensed matter that occur on the timescale of the inverse of an optical phonon period. Such phonons coherently modify the structure factor of the crystal, giving rise to sidebands, and the possibility of creating X-ray switches. On timescales short compared with extinction depth traversal times the time dependence of the wave-fields must be explicitly incorporated into the theory, and the coherence properties of the diffracted radiation are modified. The possibility of re-compressing chirped FEL X-ray pulses will also be discussed.